



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
**SEATTLE DISTRICT, CORPS OF ENGINEERS**  
**P.O. BOX 3755**  
**SEATTLE, WASHINGTON 98124-3755**

CENWS-PM-PL-ER

**DRAFT**  
**FINDING OF NO SIGNIFICANT IMPACT**

*SEWARD PARK, KING COUNTY, WASHINGTON*  
*LAKESHORE SUBSTRATE ENHANCEMENT PROJECT*

1. Background. The proposed action is described in detail in the attached environmental assessment (EA). The purpose of this project is to enhance the lake shore substrate along the Lake Washington shoreline of Seward Park, King County, Washington in order to improve rearing habitat for juvenile chinook salmon. This project is authorized under Section 216, Public Law 91-611, Review of Completed Projects, River, Harbor and Flood Control act of 1970.
2. Action. This substrate enhancement consists of placing a 1-foot-thick layer of fine and coarse gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. Material would be placed from a barge with the dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot.
3. Alternatives. "No Action" and "Substrate Removal" were considered as alternatives and rejected in favor of the preferred plan because they would not meet project objectives and/or were more costly.
4. Evaluation. The EA for the proposed work was circulated to governmental agencies and other interested parties. There was no opposition or negative response. Resource agencies are supportive of the project. The proposed project will not negatively impact the Seward Park area and its natural resources. The proposed action will comply with all applicable laws, regulations, and agency consultations.
5. Section 404 (b) (1) Evaluation. A section 404(b)(1) evaluation has been prepared for the project and determined that the project includes appropriate and practicable steps to minimize adverse impacts to the aquatic ecosystem, and that there is no practicable alternative that would have less impact on the aquatic environment.
6. Finding of No Significant Impact. It has been determined that performance of this work, in accordance with the conditions herein described or referenced, is not a major federal action that will significantly affect the quality of the human environment, and thus does not require the preparation of an Environmental Impact Statement.

**DRAFT FONSI - WOULD BE SIGNED FOLLOWING THE REVIEW PERIOD, IF APPROPRIATE**

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Date

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Ralph H. Graves  
Colonel, Corps of Engineers  
District Engineer

**Draft Environmental Assessment**  
**SEWARD PARK**  
**LAKESHORE SUBSTRATE ENHANCEMENT**

**Seattle, King County, Washington**  
**September, 2001**

**Responsible Agency:** The responsible agency for this project is the U.S. Army Corps of Engineers, Seattle District.

**Abstract:** The proposed action is described in detail in the attached environmental assessment (EA). The purpose of this project is to enhance the lake shore substrate along the Lake Washington shoreline at Seward Park, King County, Washington in order to improve shoreline rearing habitat for juvenile chinook. This project is being preformed under Section 216, Public Law 91-611, Review of Completed Projects, River, Harbor and Flood Control act of 1970. The Corps and the City of Seattle propose to improve the nearshore habitat for juvenile chinook salmon by placing a layer of sand/gravel substrate over the present substrate. This is based on the work which found evidence in southern Lake Washington that juvenile chinook prefer a sand/gravel substrate and avoidance towards larger substrate (cobble/boulder). The work will consist of placing a 1-foot-thick layer of fine and course gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. Material would be placed from a barge with the dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot). "No Action" and "Substrate Removal" were considers as alternatives and rejected in favor of the preferred plan because they would not meet project objectives and/or were more costly.

THE OFFICIAL COMMENT PERIOD ON THIS ENVIRONMENTAL ASSESSMENT  
ENDS ON OCTOBER 30, 2001.

This document is also available online at:  
<http://www.nws.usace.army.mil/ers/envirdocs.html>

Please send questions and requests for additional information to:

Dean G. Paron  
Environmental Resources Section  
U.S. Army Corps of Engineers  
P.O. Box 3775  
Seattle, Washington 98124-3755  
dean.g.paron@usace.army.mil  
(206) 764-3636

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## 1. INTRODUCTION

### 1.1 PROJECT BACKGROUND

**1.1.1 Project Authorization.** This study is being performed under Section 216, Public Law 91-611, Review of Completed Projects, River, Harbor and Flood Control act of 1970. The Lake Washington Basin Restoration Study is evaluating creation of specific habitat improvements throughout the basin for fish and wildlife.

**1.1.2 Project Purpose.** The purpose of this project is to design a substrate modification demonstration project along the shoreline of Seward Park, Seattle, Washington that would provide information on how to improve shoreline rearing habitat for juvenile chinook along the nearshore of Lake Washington. Ultimately the purpose of this project will be to help restore Lake Washington salmon runs.

#### **1.1.3. Project Location.**

The project will take place along the Lake Washington shoreline at the northeast corner of Seward Park in the City of Seattle, King County, Washington (T 23N, R 4E, S 14). The approximate northern limit of the project would be N 209,046.82, E 1,291,609.65 and the approximate southern limit of the project would be N 208,153.49, E 1,292,059.08. A location map is enclosed as Appendix A.

**1.1.4 Project Need.** The Lake Washington watershed drains 607 square miles and may be the most productive salmon system in the Pacific Northwest. However, the chinook populations within the basin have been dramatically declining in recent years. In March 1999 the National Marine Fisheries Service (NMFS) listed Puget Sound Chinook salmon as threatened. Seattle's Lake Washington shoreline clearly is not pristine habitat. A recent survey of the City's shorelines demonstrates a high degree of development that has eliminated or altered most shallow water shoreline habitat. It is generally presumed that shallow shoreline habitat is preferred habitat and that most juvenile chinook generally use the lake shoreline for rearing and passage from late winter through early summer. Therefore, the development of Lake Washington's shoreline most likely has substantially altered juvenile chinook rearing habitat and may be a factor for the decline of chinook throughout the basin.

The Corps and the City of Seattle theorize that they can improve the nearshore habitat for juvenile chinook salmon by placing a layer of sand/gravel substrate over the present substrate. This is based on the work done by Piaskowski and Tabor (2001) which found evidence in southern Lake Washington that juvenile chinook prefer a sand/gravel substrate and avoidance towards larger substrate (cobble/boulder). Since the current substrate along Seward Park consists mainly of quarry spalls that have washed out into the nearshore habitat creating an "armored" substrate, the addition of a sand substrate will provide a habitat more suitable for juvenile chinook rearing.

Information gained from this project will be used on future restoration projects throughout the basin. While the physical changes to littoral zone habitats resulting from shoreline development are clear, we lack information linking these alterations to changes in the growth and survival of juvenile salmon. Because of the large amount of

uncertainty that still exists in understanding the responses of juvenile salmon to shoreline to habitat changes, this project is to be carefully monitored. Environmental monitoring will be completed pre and post construction by US Fish and Wildlife Service, Washington Department of Fish and Wildlife and the University of Washington.

## 1.2 SCOPE OF THIS EA (YEAR 2001)

The US Army Corps of Engineers, Seattle District prepared this EA to assess the environmental effects of implementing a nearshore rehabilitation project at Seward Park to help restore salmon and steelhead runs in the Lake Washington watershed.

## 1.3 DESCRIPTION OF THE ACTION

This rehabilitation measure consists of placing a 1-foot-thick layer of fine and coarse gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. Material would be placed from a barge with the dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot). The area proposed for placement is approximately 1000 lineal feet along the east shore. The required quantity of sand, gravel, and cobbles is estimated at 1400 cy or approximately 2,000 tons. The west shore site would be divided into two areas, one for fine grained, sandy material and one coarse gravel and cobbles. The placement method will be one that has been used successfully in the past. This method consists of offloading material from a barge by conveyor. This placement method allows material to be placed accurately and efficiently (Figure 1.3.1).



Figure 1.3.1. Barge offloading substrate material by conveyor belt as proposed as an alternative for use in the Seward Park Rehabilitation Project, King County, Washington.

<b>Table 1.3.1 Habitat Rehabilitation Gradation</b>		
<b>US Standard Sieve Size</b>	<b>Percent Passing by Weight</b>	
	<b>Coarse</b>	<b>Fine</b>
6 inches	100	100
3 inches	50-100	90-100
1 ½ inches		60-90
¾ inches	0-40	
3/8 inches	0-6	
No. 4		40-70
No. 40		15 -45
No. 200	0-3	0-3

## 1.4 PROJECT SCHEDULE

Construction of the project would be completed by contract and occur within the fish work window of July 16-December 31. The Corps will consult with State, Tribal, and Federal agencies to design a project work window that will allow construction during periods that will have minimal or discountable effects on listed salmonids.

The contract will be competitively bid, with advertisement and award of the contract to begin as soon as possible after the local sponsor and the Corps obtains all the necessary lands, easements, relocations, rights-of-way, and disposal areas (LERRD) and permits. At this time, construction of the project is scheduled for December 2001, although the actual date could be earlier or later and depends on when the local sponsor and the Corps obtain the necessary permits. Construction of the project is anticipated to occur over 1 -2 days.

## 1.5. LOCAL SPONSOR

The Lake Washington GI study is sponsored by the City of Seattle Public Utilities and King County. This particular project is being funded by the City of Seattle. The Washington State Department of Fish and Wildlife, the Sammamish Forum, and the Water Resources Inventory Area (WRIA) 8 are strong study partners.

## 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

In order to comply with the National Environmental Policy Act (NEPA), CEQ rules, and Corps regulations, Seattle District performs a analysis of alternatives (potential actions) purpose and need of the project. This chapter describes the alternatives and summarizes the environmental consequences of the alternatives.

### 2.1 NO ACTION ALTERNATIVE

Under No Action, the Corps would leave the nearshore habitat in its present condition. This alternative would not improve the marginal to poor quality of the shoreline habitat for salmonids. However, it there would be no temporary construction impacts as a result of no action.

## 2.2 SUBSTRATE REMOVAL ALTERNATIVE

Under this alternative the Corps would remove the quarry spall substrate. This would be accomplished using hydraulic excavators to pull out the larger substrate leaving the behind a sand/silt substrate which would not provide the level of habitat benefit desired and would be more costly than the preferred plan. Also, disposal of excavated material would an issue as well.

## 2.3 PREFERRED ALTERNATIVE- SUBSTRATE SUPPLEMENT

This alternative consists of placing a 1-foot-thick layer of large and small gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects.

The selection and location of this alternative was based on the following criteria:

- The project will have adequate monitoring to ensure the level of success of project features, particularly in regard to chinook salmon.
- The proposed work is compatible with other ongoing environmental restoration, recovery, and monitoring efforts by federal, state, and local agencies.
- Public health, safety, and well being will be protected.
- Analyses of benefits and costs are to be conducted in accordance with Corps regulations and must ensure that any plan is complete, efficient, safe, and economically cost effective in terms of current prices.
- Input from the local sponsor(s), resource agencies, and project staff will be incorporated into plan selection and design.
- The with-project condition will not significantly impact recreational navigation.
- The project will not interfere significantly with public visitation and enjoyment of the park.
- The project will not interfere with state and tribal fish management authorities.

Based on the aforementioned criteria, the eastside of Seward Park was selected. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. The dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot).

## 3. AFFECTED ENVIRONMENT

This chapter presents relevant resource components of the existing environment, that is the baseline environment. In general, the Seward Park (Bailey Peninsula) shoreline habitat is composed of medium-sized gravel substrate; however, the banks have been

armored in many places with concrete blocks and rock riprap to prevent erosion. Other sections of the shoreline are unarmored and eroding to a moderate degree. Terrestrial vegetation is minimal on the north shore of Seward Park, becoming more dense on the east side. The south shore is armored with a concrete wall (layers of concrete) approximately 0.9 m high (ft) containing grass down to waters edge. The wall does not appear to be an effective bank protection measure. The south and east shore of the peninsula are subject to significant wave action from prevailing winds during fall, winter, and spring. On the north shore, the City constructed a project approximately twenty years ago to nourish the beach with gravel and place two submerged angular-rock berms. The outer shoreline along eastern Seward Park is comprised of relatively steep gradient, while the bay inside Seward Park (Andrews Bay) is relatively shallow and well vegetated.

### 3.1 CLIMATE

The Northwest's climate is relatively mild. The Olympic Mountains and the Cascades border and protect Seattle from weather systems from the north and east. Nearness to water and the Pacific Ocean help to temper severe heat and cold. Extremes of heat or cold are infrequent and of short duration; the daily temperature variation is small. Winter temperatures seldom dip below freezing and summers are a warm 75-80°F. Annual rainfall averages 36 inches, concentrated in the winter and early spring. Snowfall is rare, except in the nearby mountains. The mild climate and abundance of nondeciduous trees keep Seattle green all year

### 3.2 AIR QUALITY/NOISE

Air quality in the Puget Sound region has been in attainment with state and federal air quality regulations during the 1990s (PSAPCA, 1996). The level of noise from the project area is caused mostly by the presence of boats and passengers.

### 3.3 VISUAL/ESTHETIC ENVIRONMENT

Lake Washington's skyline is dominated by Mt. Rainier. Lake Washington's shoreline is largely bordered by private waterfront homes with land-scaped yards. Single-family uses along Lake Washington account for approximately 50% of shoreline use. Between the I-90 bridge and Union Bay, shoreline development also includes apartments as well as several overwater condominiums. Natural vegetation is present along only 22% of the City's northern Lake Washington shoreline, and only 11% of the City's southern shoreline. However, Seward Park provides a substantial exception to this highly modified shoreline condition. Seward Park has a rare example of an urban lowland old growth forest covering about 120 acres on the northern 2/3 of the Bailey Peninsula.

### 3.4 PHYSICAL AND GEOLOGIC ENVIRONMENT

Lake Washington is a large mesotrophic lowland lake forming the eastern boundary of the City of Seattle, King County, Washington. Lake Washington took form at the end of the Ice Age nearly 12,000 years ago. Early in its history it was connected to Puget sound, but within 1000 years of origin it became separated and has been a freshwater lake ever

since. The lake is the second largest natural lake in the state of Washington, with a width of 1.6 to 6.1 km, a length of 34 km, at total surface area of 9,495 hectares (at full pool, 6.71 m above MSL) and a mean and maximum depth of 33 m and 67 m, respectively (Wolcott 1973, Bartoo 1977, Brenner et al. 1990, USACE 1992). The Bailey Peninsula (and most of Seattle) is blanketed with glacial till or "hardpan", a mix of silt, sand, gravel and clay with occasional cobbles and boulders that was deposited under or in contact from the glacial ice sheet. Much of this material was transported long distances: the gravels seen along the lakeshore are more likely to contain glacially transported rock from British Columbia than local bedrock. The same transport explains the scattered larger rocks (glacial erratics) seen on the northeast shore and other places in the park. Several such erratics are visible across Andrews Bay at Ferdinand Street Park. Major troughs in the Puget Lowland such as the Lake Washington basin were probably carved by subglacial meltwater channels. Drumlins such as the Bailey Peninsula were probably formed under the edge of the ice as it retreated. Lake and meltwater deposits similar to those of the advance outwash formed as the ice receded, but these recessional outwash deposits are much smaller than the advance outwash and are confined mainly to the troughs.

The Lake Washington shoreline, 146 km at full pool, is more than 78% developed with very few kilometers of shoreline in parks or other semi-natural privately owned areas (Chrzastowski 1981). Lake Washington also suffers from a limited littoral area, approximately 7.8% of the total surface area and 8.7% of the total volume are between 0-5 m depth (mean pool = 6.4 m) (Ajwani 1956).

Lake Washington drains a watershed of 1,579 km<sup>2</sup> (607 mi<sup>2</sup>) and has its outlet at the Lake Washington Ship Canal (Figure 1). The Ship Canal is 13 km long and has a minimum depth of 9.1 m (USACE 1992). The Cedar River, the largest (42 - 53% of total inflow) tributary with an average discharge of 19.9 cms (704 cfs), enters at the southern end of Lake Washington. The second largest tributary is the Sammamish River, draining Lake Sammamish to the east and entering at the north end of Lake Washington. Sammamish River inflow (mean = 10.4 cms (367 cfs)), comprises 30% of total inflow to lake Washington (Chrzastowski 1981, Solomon 1994). The average water-residence time in Lake Washington is 2.3 years (Edmondson and Lehman 1981).

Inflowing water from the Cedar River is colder and denser than the surface water of Lake Washington during most of the year and thus, tends to sink upon entry to the lake. Inflow from the river enters the lake, settles to a level between the lake surface and the metalimnion and expands horizontally. The prevailing wind direction is predominantly from the south and southwest during the fall, winter, and spring, gusting up to 112 km hr<sup>-1</sup> (70 mph), while summer winds are generally light and from the north. The combination of wind and Cedar River inflow creates rotating current that provides an overall movement of surface water to the north (CH2M Hill 1975, Solomon 1994). In winter and spring, unmixed Cedar River water may reach as far north as Madison Park during storm events (Edmondson 1991).

Prior to 1916, the Black River, located at the southern end of Lake Washington, was the main outlet. The Cedar River discharged into the Black River immediately below the lake, and then flowed into the Duwamish River and into Puget Sound. The Lake

Washington Ship Canal was dredged to provide navigation from Lake Washington through Lake Union to Puget Sound. The elevation of Lake Washington was also lowered by approximately 2.7 m (9 ft) to that of Lake Union, subsequently the lake now flows through the Ship Canal instead of the Black River channel. The Cedar River was diverted into Lake Washington to maintain the lake level, whereby increasing lake inflow decreased water residence time of Lake Washington (WRIA 1975, Chrzastowski 1981). The Cedar River is regulated by the operation of Cedar Falls Hydroelectric Project, located downstream from Chester Morse Lake, and the annual diversion of approximately 4.8 cms at Landsburg Dam by the City of Seattle Water Department (Stober and Hamalainen 1979).

The elevation of Lake Washington is controlled by the Corps at the Hiram Chittenden Locks (Locks) by regulated outflow through a spillway and lock facility. Throughout the year, the lake level is allowed to fluctuate between 6.09 m (20 ft MSL) and 6.71 m (22 ft) elevation. The lower level (6.1 m) is maintained during the winter for flood storage, to create a "flood pocket" for excess storm water runoff. Lake refill begins on 15 February (6.1 m), and continues until the lake level reaches 6.66 m (21.85 ft), generally in the first week of May. From the first week of May to 31 July, the lake level fluctuates between 6.66 to 6.71 m. Drafting of the lake begins at the end of July, while the average refill rate is 0.007 m per day. Maximum daily extremes of  $\pm 0.046$  m in response to flood control situations occasionally occur throughout the winter.

### 3.5 WATER AND SEDIMENT QUALITY

On the whole, the water quality of Lake Washington is extraordinary for a large lake surrounded by urban development. Key factors for the lake's excellent water quality include: the cleanliness of the Cedar River, which provides half of its inflow; a rapid flushing rate, with average water residence only 2.3 years; the lake's depth, which causes waters in the lake to mix from top to bottom annually, oxygenating the lowest waters (which prevents the chemical release of phosphorus from the lake floor).

However, the water and sediment quality in the Lake Washington Basin has been, and continues to be, degraded from a variety of point and non-point sources of pollutants. Historically, Lake Washington, Lake Union, and the Ship Canal were the receiving water bodies for municipal sewage. Outfalls were located at numerous places along the shorelines and limited treatment or no treatment of sewage occurred prior to discharge. Efforts in the 1960s and 1970s to clean up Lake Washington and other Seattle area waterways led to the expansion of wastewater treatment efforts and the elimination of discharges of untreated effluent into Lake Washington.

The ecology of Lake Washington has undergone substantial changes over the last 75 years. Years of sewage discharge into the lake increased phosphorus concentration and subsequently led to eutrophication of the lake. Bluegreen algae dominated the phytoplankton community, and productions of some species of zooplankton was suppressed. In the mid 1960s, water quality improved dramatically as sewage was diverted from the lake to Puget Sound. Dominance by blue-green algae subsided and zooplankton populations rebounded, indicating a return to more natural environmental

conditions. However, around the same time period (1970s) Eurasian water-milfoil was introduced into Lake Washington.

Milfoil can cause localized water quality problems when it forms dense floating mats. Under the mat, other rooted macrophytes (aquatic plants) and the lower layers of the mat die and decompose, increasing biological oxygen demand and reducing DO and pH. In certain areas, conditions can become anoxic (lacking oxygen). Furthermore, substrates rapidly change from sand or gravel to mud because of the large amount of decomposition that occurs. Milfoil has established itself in much of the shallow shoreline habitat (less than 33 ft or 10 m deep) of Lake Washington.

### 3.6 BIOLOGICAL RESOURCES

#### 3.6.1 Fish

The Lake Washington basin contains about 650 linear miles of rivers and creeks; important runs of sockeye, steelhead trout, chinook, and coho, salmon migrate into the basin each year produced by natural spawning and hatchery production. The major fish-producing streams are the Sammamish and Cedar Rivers.

Over 50 freshwater and anadromous fish species are found within the Lake Washington basin. Of these, over 20 are non-native species introduced into the system over the last 140 years by agencies or private individuals, see Table 3-1 below.

Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye salmon (*O. nerka*), coastal cutthroat trout (*O. clarki clarki*), and steelhead (*O. mykiss*) are the five anadromous salmonid species found in the Lake Washington basin that pass through the project area. In addition, char (*Salvelinus spp.*, most probably bull trout) may be found sporadically from the lower Cedar River (below Landsburg Dam) downstream to the Locks, but there is little information to substantiate their status as a native spawning and rearing stock outside the Lake Chester Morse bull trout (*S. confluentus*) population.

Salmon are considered a “keystone” species upon which producers and consumers from the bottom to the top of the food chain depend (Wilson and Halupka 1995). Rearing in the rich-ocean waters, adult salmon return to nutrient poor streams with a wealth of ocean nutrients, enriching the food web from primary producers to top carnivores. At the top of the food web, at least 22 species of wildlife, including black bear, mink, river otter, and bald eagle, feed on salmon carcasses (Cedarholm et al. 1989). At the base of the food web, salmon carcasses provide significant, if not major amounts of nitrogen to streamside vegetation as well as large amounts of carbon and nitrogen to aquatic insects and other macroinvertebrates (Bilby et al. 1996).

There are two permanent hatcheries in the basin, Issaquah Creek run by the WDFW, and the University of Washington hatchery at the head of the Ship Canal. These hatcheries currently raise coho and chinook salmon. Future plans for the Issaquah Creek hatchery include modifying the facility and the types of fish reared with a future emphasis on rare or endangered fish endemic to the basin.

**TABLE 3.6.1-1. MIGRATORY AND FRESHWATER FISHES OF THE LAKE WASHINGTON BASIN.**  
ADAPTED FROM WARNER AND FRESH (1999).

<b>Table 3-6.1 -1. Fishes of Lake Washington Basin</b>			
<b>Primary Habitat</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Life-History Strategy</b>
<i>Native Species</i>	<b>Western brook lamprey</b>	<i>Lampetra richardsoni</i>	Stream resident
	<b>Pacific lamprey</b>	<i>Lampetra tridentatus</i>	Anadromous
	<b>River lamprey</b>	<i>Lampetra ayresi</i>	Anadromous
	<b>White sturgeon</b>	<i>Acipenser transmontanus</i>	Anadromous
	<b>Pygmy whitefish</b>	<i>Prosopium coulteri</i>	Adfluvial
	<b>Mountain whitefish</b>	<i>Prosopium williamsoni</i>	Fluvial
	<b>Cutthroat trout</b>	<i>Oncorhynchus clarki clarki</i>	Anadromous, Adfluvial, Resident
	<b>Steelhead and Rainbow Trout</b>	<i>Oncorhynchus mykiss</i>	Anadromous, Adfluvial, Resident
	<b>Dolly Varden</b>	<i>Salvelinus malma</i>	Anadromous
	<b>Bull trout</b>	<i>Salvelinus confluentus</i>	Adfluvial, Anadromous
	<b>Coho salmon</b>	<i>Oncorhynchus kisutch</i>	Anadromous
	<b>Chinook salmon</b>	<i>Oncorhynchus tshawytscha</i>	Anadromous
	<b>Sockeye salmon and kokanee</b>	<i>Oncorhynchus nerka</i>	Anadromous, Adfluvial, Resident
	<b>Chum salmon</b>	<i>Oncorhynchus keta</i>	Anadromous
	<b>Pink salmon</b>	<i>Oncorhynchus gorbuscha</i>	Anadromous
	<b>Longfin smelt</b>	<i>Spirincus thaleichthys</i>	Anadromous, Adfluvial
	<b>Redsided shiner</b>	<i>Richardsoni balteatus</i>	Resident
	<b>Longnose dace</b>	<i>Rhinichthys cataractae</i>	Resident
	<b>Northern squawfish</b>	<i>Ptychocheilus oregonensis</i>	Lake Resident
	<b>Peamouth chub</b>	<i>Mylocheilus caurinus</i>	Lake Resident
	<b>Speckled dace</b>	<i>Rhinichthys osculus</i>	Resident
	<b>Largescale sucker</b>	<i>Catostomus macrocheilus</i>	Resident
	<b>Three-spine stickleback</b>	<i>Gasterosteus aculeatus</i>	Resident
	<b>Coastrange Sculpin</b>	<i>Cottus aleuticus</i>	Resident
	<b>Shorthead sculpin</b>	<i>Cottus confusus</i>	Resident
	<b>Torrent sculpin</b>	<i>Cottus rhotheus</i>	Stream Resident
	<b>Prickly sculpin</b>	<i>Cottus asper</i>	Resident
	<b>Riffle sculpin</b>	<i>Cottus gulosus</i>	Stream resident
	<b>Reticulate sculpin</b>	<i>Cottus perplexus</i>	Resident
	<b>Olympic mudminnow</b>	<i>Nobumbra hubbsi</i>	Stream Resident
<i>Non-Native Species</i>	<b>American shad</b>	<i>Alosa sapidissima</i>	Anadromous
	<b>Lake whitefish</b>	<i>Coregonus clupeaformis</i>	Lake Resident
	<b>Brown trout</b>	<i>Salmon trutta</i>	Adfluvial, Anadromous
	<b>Atlantic salmon</b>	<i>Salmon salar</i>	Anadromous
	<b>Brook trout</b>	<i>Salvelinus fontinalis</i>	Stream Resident
	<b>Lake trout</b>	<i>Salvelinus namaycush</i>	Lake Resident
	<b>Cherry salmon</b>	<i>Oncorhynchus masou</i>	Anadromous
	<b>Weather loach</b>	<i>Misgurnus anguillicaudatus</i>	Lake Resident
	<b>Common carp</b>	<i>Cyprinus carpio</i>	Lake Resident
	<b>Grass carp</b>	<i>Ctenopharengodon idella</i>	Lake Resident
	<b>Goldfish</b>	<i>Carassius auratus</i>	Stream or Lake Resident
	<b>Tench</b>	<i>Tinca tinca</i>	Lake Resident
	<b>Channel catfish</b>	<i>Ictalurus punctatus</i>	Lake Resident
	<b>Brown bullhead</b>	<i>Ictalurus nebulosus</i>	Lake Resident
	<b>Black bullhead</b>	<i>Ictalurus melas</i>	Lake Resident

<b>Largemouth bass</b>	<i>Micropterus salmoides</i>	Stream or Lake Resident
<b>Smallmouth bass</b>	<i>Micropterus dolomieu</i>	Stream or Lake Resident
<b>Black crappie</b>	<i>Pomoxis nigromaculatus</i>	Lake Resident
<b>White crappie</b>	<i>Pomoxis annularis</i>	Lake Resident
<b>Warmouth</b>	<i>Lepomis gulosus</i>	Lake Resident
<b>Bluegill</b>	<i>Bepomis macrocheilus</i>	Lake Resident
<b>Pumpkinseed sunfish</b>	<i>Lepomis gibbosus</i>	Lake Resident
<b>Yellow perch</b>	<i>Perca flavescens</i>	Lake Resident

### 3.6.3. Wildlife

**Mammals** - Lake Washington supports a diverse and abundant array of wildlife species. Seward Park is too small and isolated to support many of the larger mammal that characterize larger forests, but it does provide shelter to mountain beavers, raccoons, deer mice, and squirrels. The forest shores are visited by muskrats, beavers, and river otters.

**Birds** -The park offers a variety of aquatic and terrestrial habitats for birds. Diving ducks, western grebes, coots and glaucous-winged gulls are often seen on the open lake. Great blue herons, pied-billed grebes, double crested cormorants and kingfishers are more frequently seen on sheltered Andrews Bay. Red-winged blackbirds are found in the marshes, while downy woodpeckers favor the Lombardy poplars planted along the lakeshore. Dippers visited the fish hatchery stream when it was in operation. Robins, starlings, crows and Canada geese frequent the lawns. Western tanagers, song sparrows and chickadees are often seen in the more open wooded and shrubby areas in the south part of the park. The old-growth forest hosts pileated woodpeckers, Steller's jays, winter wrens, western screech-owls and red-breasted nuthatches.

Many birds are resident all year long, while others visit seasonally. Most people are familiar with songbirds that visit in the summer to breed but fly south for the winter. The Seattle area also receives many winter visitors from farther north. Other birds merely pass through our area on their way northward or southward in the spring or fall. Some birds migrate seasonally not north or south, but between the lowlands and the mountains, between the west and east sides of the Cascades, or between coastal and interior waters. Among the year-round residents are mallards, pied-billed grebes, great blue herons, western screech owls, crows, Steller's jays, chickadees, nuthatches, bushtits, woodpeckers, wrens, song sparrows and towhees.

Summer visitors include ospreys, rufous hummingbirds, western tanagers, swallows, warblers and Swainson's thrushes. Greater white-fronted geese and migratory Canada geese pass through the park in the spring and fall. Many kinds of waterfowl are winter visitors. Double-crested cormorants, common loons and most kinds of grebes, gulls and ducks are seen primarily in the winter. Varied thrushes and dark-eyed juncos are among the birds that come to the lowlands from the mountains for the winter

Among the most unusual birds in the park are the exotic conures. These noisy parakeets have inhabited the park for several years and are often seen around the north bluff of Pinoy Hill. They have been identified as Chapman's mitred conure or as the closely related scarlet-fronted conure, both native to Peru. They have been observed eating

bigleaf maple flowers and visiting neighborhood feeders where they enjoy sunflower seeds. In winter they are more frequently observed in the Maple Leaf neighborhood.

Table 3.6.3.1. This list contains birds that may occur in the Seward Park area:

<b>Table 3.6.3.1 BIRDS FOUND IN/NEAR SEWARD PARK</b>			
<b>Common name</b>	<b>Scientific Name</b>	<b>Common name</b>	<b>Scientific Name</b>
<b>Loons</b>		<b>Hummingbirds</b>	
Red-throated Loon	<i>Gavia stellata</i>	Anna's Hummingbird	<i>Calypte anna</i>
Common Loon	<i>Gavia immer</i>	Rufous Hummingbird	<i>Selasphorus rufus</i>
Yellow-billed Loon	<i>Gavia adamsii</i>	<b>Kingfishers</b>	
<b>Grebes</b>		Belted Kingfisher	<i>Ceryle alcyon</i>
Pied-billed Grebe	<i>Podilymbus podiceps</i>	<b>Woodpeckers</b>	
Horned Grebe	<i>Podiceps auritus</i>	Lewis' Woodpecker	<i>Melanerpes lewis</i>
Red-necked Grebe	<i>Podiceps grisegena</i>	Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>
Eared Grebe	<i>Podiceps nigricollis</i>	Downy Woodpecker	<i>Picoides pubescens</i>
Western Grebe	<i>Aechmophorus occidentalis</i>	Hairy Woodpecker	<i>Picoides villosus</i>
<b>Cormorants</b>		Northern Flicker	<i>Colaptes auratus</i>
Double-crested Cormorant	<i>Phalacrocorax occidentalis</i>	Pileated Woodpecker	<i>Dryocopus pileatus</i>
<b>Hérons</b>		<b>Tyrant Flycatchers</b>	
Great Blue Heron	<i>Ardea herodias</i>	Olive-sided Flycatcher	<i>Contopus cooperi</i>
Green-backed Heron	<i>Butorides striatus</i>	<b>Empidonax Flycatchers</b>	
<b>Swans, Geese, Ducks</b>		Western Flycatcher	<i>Empidonax</i>
Greater White-fronted Goose	<i>Anser albifrons</i>	<b>Vireos</b>	
Chinese Goose	<i>Anser cygnoides</i>	Hutton's Vireo	<i>Vireo huttoni</i>
Canada Goose	<i>Branta canadensis</i>	Red-eyed Vireo	<i>Vireo olivaceus</i>
Trumpeter Swan	<i>Cygnus buccinator</i>	<b>Crows, Jays</b>	
Gadwall	<i>Anas strepera</i>	Steller's Jay	<i>Cyanocitta stelleri</i>
Eurasian Wigeon	<i>Anas penelope</i>	American Crow	<i>Corvus brachyrhincos</i>
American Wigeon	<i>Anas americana</i>	Swallows	
Mallard	<i>Anas platyrhynchos</i>	Tree Swallow	<i>Tachycineta bicolor</i>
Northern Shoveler	<i>Anas clypeata</i>	Violet-green Swallow	<i>Tachycineta thalassina</i>
Northern Pintail	<i>Anas acuta</i>	Barn Swallow	<i>Hirundo rustica</i>
Domestic Duck	<i>Anas domesticus</i>	<b>Chickadees, Titmice</b>	
Canvasback	<i>Aythya valisineria</i>	Black-capped Chickadee	<i>Poecile atricapillus</i>
Redhead	<i>Aythya americana</i>	Chestnut-backed Chickadee	<i>Poecile rufescens</i>
Ring-necked Duck	<i>Aythya collaris</i>	<b>Bushtits</b>	
Greater Scaup	<i>Aythya marila</i>	Bushtit	<i>Psaltiriparus minimus</i>
Lesser Scaup	<i>Aythya affinis</i>	<b>Creepers</b>	
Bufflehead	<i>Bucephala albeola</i>	Brown Creeper	<i>Certhia americana</i>
Common Goldeneye	<i>Bucephala clangula</i>	Nuthatches	
Barrow's Goldeneye	<i>Bucephala islandica</i>	Red-breasted Nuthatch	<i>Sitta canadensis</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>	<b>Wrens</b>	
Common Merganser	<i>Mergus merganser</i>	Bewick's Wren	<i>Thyromanes bewickii</i>
Red-breasted Merganser	<i>Mergus serrator</i>	Winter Wren	<i>Troglodytes troglodytes</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>	<b>Dippers</b>	

<b>Eagles and Hawks</b>		American Dipper	<i>Cinclus mexicanus</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>	<b>Kinglets</b>	
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Ruby-crowned Kinglet	<i>Regulus calendula</i>
Cooper's Hawk	<i>Accipiter cooperi</i>	Golden-crowned Kinglet	<i>Regulus satrapas</i>
Northern Goshawk	<i>Accipiter gentili</i>	<b>Thrushes</b>	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Varied Thrush	<i>Ixoreus naevius</i>
<b>Falcons</b>		Swainson's Thrush	<i>Catharus ustulatus</i>
Merlin	<i>Falco columbarius</i>	Hermit Thrush	<i>Catharus guttatus</i>
Peregrine Falcon	<i>Falco peregrinus</i>	American Robin	<i>Turdus migratorius</i>
<b>New World Quail</b>		<b>Starlings, Mynas</b>	
California Quail	<i>Callipepla californica</i>	European Starling	<i>Sturnus vulgaris</i>
<b>Rails, Coots</b>		<b>Waxwings</b>	
<b>Virginia</b>			
Rail	<i>Rallus limicola</i>	Cedar Waxwing	<i>Bombycilla cedorum</i>
American Coot	<i>Fulica americana</i>	<b>Wood-Warblers</b>	
<b>Lapwings, Plovers</b>		Yellow-rumped Warbler	<i>Dendroica coronata</i>
		Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Killdeer	<i>Charadrius vociferus</i>	Townsend's Warbler	<i>Dendroica townsendi</i>
<b>Sandpipers, Phalaropes</b>		Hermit Warbler	<i>Dendroica occidentalis</i>
Spotted Sandpiper	<i>Actitis macularia</i>	Yellow Warbler	<i>Dendroica petechia</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>	Wilson's Warbler	<i>Wilsonia pusilla</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>		
<b>Skuas, Gulls, Terns</b>		<b>Tanagers</b>	
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	Western Tanager	<i>Piranga ludoviciana</i>
Bonaparte's Gull	<i>Larus philadelphia</i>	<b>Sparrows</b>	
Mew Gull	<i>Larus canus</i>	Spotted Towhee (formerly, Rufous-Sided Towhee)	<i>Pipilo maculatus</i>
Ring-billed Gull	<i>Larus delawarensis</i>	Fox Sparrow	<i>Passerella iliaca</i>
Glaucous-winged Gull	<i>Larus glaucescens</i>	Song Sparrow	<i>Melospiza melodia</i>
Western X Glaucous-winged Gull	<i>Larus occidentalis X Larus glaucescens</i>	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
Sabine's Gull	<i>Xema sabini</i>	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Caspian Tern	<i>Sterna caspia</i>	Dark-eyed Junco	<i>Junco hyemalis</i>
<b>Pigeons, Doves</b>		<b>Cardinals, Grosbeaks</b>	
Band-tailed Pigeon	<i>Columbia fasciata</i>	Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Rock Dove	<i>Columbia livia</i>	Blackbirds	
<b>Parakeets, Parrots</b>		Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Mitred (Scarlet-fronted) Conure	<i>Psittacara mitrata alticola (P. wagleri)</i>	Brown-headed Cowbird	<i>Molothrus aeneus</i>
<b>Owls</b>		Bullock's Oriole	<i>Icterus bullockii</i>
Great Horned Owl	<i>Bubo virginianus</i>	<b>Finches</b>	
Western Screech-Owl	<i>Otus kennicotti</i>	Purple Finch	<i>Carpodacus purpureus</i>
Barred Owl	<i>Strix varia</i>	House Finch	<i>Carpodacus mexicanus</i>
Northern Saw-whet Owl	<i>Aegolias acadicus</i>	Red Crossbill	<i>Loxia curvirostra</i>
<b>Swifts</b>		Pine Siskin	<i>Carduelis pinus</i>
Vaux's Swift	<i>Chaetura vauxi</i>	<b>Old World Sparrows</b>	
		House Sparrow	<i>Passer domesticus</i>

### 3.6.4 Flora

Seward Park contains the "Magnificent Forest", a rare example of an urban lowland old growth forest. While old trees can be found in a few other parks in Seattle, the Magnificent Forest, covering about 120 acres on the northern 2/3 of the Bailey Peninsula, is the largest stand of old trees in the city. Old growth forest is characterized by trees of various ages including large trees >250 years old, by a multi-layered canopy, by standing snags and by large down logs. The Magnificent Forest has these features, but for an old growth forest it is young, with many trees less than 200 years old.

The dominant tree of the Magnificent Forest is Douglas fir. Western red cedar, bigleaf maple and madrona are also well-represented. Western hemlock is found mainly toward the northern end of the peninsula. The shrub understory is composed largely of salmonberry, thimbleberry, elderberry, Indian plum, hazelnut, sword fern, and Cascade Oregon grape. The abundance of madronas, both in the forest and in the developed southern part of the park, indicates a well-drained, relatively dry site. The Bailey Peninsula is one of the few sites in Seattle where bedrock reaches the surface. The shallow soils overlaying the bedrock combined with the topography of the peninsula contribute to good drainage and dryness.

Unlike the forest, the lakeshore is very young. The present shoreline was created in 1916 when the Montlake cut of the Lake Washington Ship Canal was opened, lowering the lake by about 9 ft. Subsequently the shoreline was graded to make the loop road. Ornamental trees such as Lombardy poplar, cherries, catalpa, and others were planted in many places along the shore, but most of the shoreline appears to have revegetated naturally. Both the forest and the marshy areas drained by the lake lowering probably served as sources of seeds. Douglas firs and thimbleberries came from the forest, and Oregon ashes, Sitka willows, rushes, sedges, cattails, and others probably came from nearby wetlands. The new shores also provided opportunity for invasive species such as Himalayan blackberry, reed canary grass, and yellow loosestrife.

Table 3.6.4-1. Vegetation of Seward Park.

Table 3.6.4-1. Vegetation of Seward Park			
Common name	Scientific Name	Common name	Scientific Name
<b>Horsetails</b>		<b>Violet Family</b>	
Common Horsetail	<i>Equisetum arvense</i>	Trailing Yellow Violet	<i>Viola sempervirens</i>
Scouring Rush	<i>Equisetum hyemale</i>	Evening Primrose Family	
Giant Horsetail	<i>Equisetum telmateia</i>	Fireweed	<i>Epilobium agustifolium</i>
<b>Ferns</b>		Willow-herb	<i>Epilobium ciliatum</i>
Deer Fern	<i>Blechnum spicant</i>	Enchanter's Nightshade	<i>Circaea alpina</i>
Licorice Fern	<i>Polypodium glycyrrhiza</i>	<b>Parsley Family</b>	
Bracken fern	<i>Pteridium aquilinum</i>	Mountain Sweet Cicely	<i>Osmorhiza chilensis</i>
Sword fern	<i>Polystichum munitum</i>	Water-parsley	<i>Oenanthe sarmentosa</i>

Lady fern	<i>Athyrium felix-femina</i>	<b>Dogwood Family</b>	
Spreading Wood Fern	<i>Dryopteris expansa</i>	Pacific Dogwood	<i>Cornus nuttalli</i>
<b>Conifers</b>		Red-OSier Dogwood	<i>Cornus stolonifera</i>
Pacific yew	<i>Taxus brevifolia</i>	Heath Family	
Western Red Cedar	<i>Thuja plicata</i>	Madrona	<i>Arbutus menzeiesii</i>
Grand Fir	<i>Abies grandis</i>	Red Huckleberry	<i>Vaccinium parviflorum</i>
Douglas Fir	<i>Pseudotsuga menziesii</i>	Evergreen Huckleberry	<i>Vaccinium ovatum</i>
Western Hemlock	<i>Tsuga heterophylla</i>	Salal	<i>Gaultheria shallon</i>
Lodgepole Pine	<i>Pinus contorta</i>	Primrose Family	
<b>Flowering Plants</b>		Star Flower	<i>Trientalis latifolia</i>
Willow Family		Olive Family	
Black Cottonwood	<i>Populus balsamifera</i>	Oregon Ash	<i>Fraxinus latifolia</i>
Sitka Willow	<i>Salix sitchensis</i>	Mint Family	
Scouler's Willow	<i>Salix scouleriana</i>	Red Dead-Nettle	<i>Lamium purpurium</i>
Pacific Willow	<i>Salix lucida</i>	Self-Heal	<i>Prunella vulgaris</i>
Hooker's Willow	<i>Salix hookeriana</i>	Hedge-Nettle	<i>Stachys cooleyae</i>
<b>Birch Family</b>		Cut-leaved Bugleweed	<i>Lycopus americanus</i>
Red Alder	<i>Alnus rubrus</i>	<b>Figwort Family</b>	
Beaked Hazelnut	<i>Corylus cornuta</i>	American Brooklime	<i>Veronica beccabunga</i>
<b>Beech Family</b>		<b>Madder Family</b>	
Garry Oak	<i>Quercus garryana</i>	Cleavers	<i>Galium aparine</i>
<b>Buckwheat Family</b>		<b>Honeysuckle Family</b>	
Mild Waterpepper	<i>Polygonum hydropiperoides</i>	Trumpet Honeysuckle	<i>Lonicera ciliosa</i>
Bitter Dock	<i>Rumex obtusifolius</i>	Hairy Honeysuckle	<i>Lonicera hispidula</i>
<b>Nettle Family</b>		Red Elderberry	<i>Sambucus racemosa</i>
Stinging Nettle	<i>Urtica dioica</i>	Blue Elderberry	<i>Sambucus cerulea</i>
Purslane Family		Common Snowberry	<i>Symphoricarpos albus</i>
Siberian Spring Beauty	<i>Claytonia sibirica</i>	Creeping Snowberry	<i>Symphoricarpos mollis</i>
Miner's Lettuce	<i>Claytonia perfoliata</i>	<b>Aster Family</b>	
<b>Hornwort Family</b>		Pathfinder	<i>Adenocaulon bicolor</i>
Coontail	<i>Ceratophyllum demersum</i>	Douglas Aster	<i>Aster subspicatus</i>
<b>Buttercup Family</b>		Leafy Beggar-ticks	<i>Bidens frondosa</i>
Baneberry	<i>Actaea rubra</i>	Western Goldenrod	<i>Solidago occidentalis</i>
<b>Barberry Family</b>		Frog's-bit Family	
Cascade Oregon Grape	<i>Mahonia nervosa</i>	Canadian Waterweed	<i>Elodea canadensis</i>
Tall Oregon grape	<i>Mahonia aquifolium</i>	<b>Water-nymph Family</b>	

Vanilla Leaf	<i>Achlys triphylla</i>	Guadalupe Water-nymph	<i>Najas guadalupensis</i>
Inside-out Flower	<i>Vancouveria hexandra</i>	<b>Pondweed Family</b>	
Saxifrage Family		Berchtold's Pondweed.....	Potamogeton berchtoldii
Fringecup	<i>Tellemia grandifolia</i>	Richardson's Pondweed	Potamogeton richardsonii
Foamflower	<i>Tiarella trifoliata</i>	<b>Rush Family</b>	
Youth-on-Age	<i>Tolmeia menziesii</i>	Tapered Rush	Juncus acuminatus
Gooseberry Family		Soft Rush	Juncus effusus
Red-Flowering Currant	<i>Ribes sanguineum</i>	Trail Rush	Juncus tenuis
<b>Hydrangea Family</b>		Dagger-Leaf Rush	Juncus ensifolius
Mockorange	<i>Philadelphus lewisii</i>	Thread Rush	Juncus filiformis
<b>Rose Family</b>		<b>Sedge Family</b>	
Hardhack	<i>Spirea douglasii</i>	Dewey Sedge	Carex deweyana
Ocean Spray	<i>Holodiscus discolor</i>	Slough Sedge	Carex obnupta
Wild Strawberry	<i>Fragaria spp.</i>	Thick-Head Sedge	Carex pachystachia
Large-leafed Avens	<i>Geum macrophyllum</i>	Sawbeak Sedge	Carex stipata
Bald-hip Rose	<i>Rosa gymnocarpa</i>	Creeping Spikerush	Eleocharis palustris
Nootka Rose	<i>Rosa nutkana</i>	Hard-Stem Bulrush	Scirpus acutus
Salmonberry	<i>Rubus spectabilis</i>	Small-Fruited Bulrush	Scirpus microcarpus
Thimbleberry	<i>Rubus parviflorus</i>	<b>Cattail Family</b>	
Trailing Blackberry	<i>Rubus ursinus</i>	Cattail	<i>Typha latifolia</i>
Blackcapped Raspberry	<i>Rubus leucodermis</i>	<b>Arum Family</b>	
Indian Plum	<i>Oemleria cerasiformia</i>	Skunk Cabbage	Lysichiton americanum
Bitter Cherry	<i>Prunus emarginata</i>	Lily Family	
Black Hawthorn	<i>Crataegus douglasii</i>	Trillium	Trillium ovatum
Saskatoon	<i>Amelanchier alnifolia</i>	Hooker's Fairybells	Disporum hookeri
Crabapple	<i>Malus fusca</i>	<b>Buckthorn Family</b>	
Sumac Family		Cascara	<i>Rhamnus purshiana</i>
Poison Oak	<i>Rhus diversiloba</i>	Snowbrush	<i>Ceanothus velutinus</i>
<b>Maple Family</b>			
Bigleaf Maple	<i>Acer macrophyllum</i>		
Vine Maple	<i>Acer circinatum</i>		

Many of the plants common to the park are invaders, often originally from Europe but widely established in North America. Some were brought as ornamentals but have fruits

that allow them to be readily dispersed by birds. Others are weedy species that are readily distributed by accidental means. Some of the most prominent are listed here

EXOTIC VEGETATION OF SEWARD PARK			
Trees and Shrubs	Vines	Groundcovers	Wetland Plants
Himalayan Blackberry	English Ivy	Lawn grasses	Yellow Loosestrife
English Holly		Creeping Buttercup	Reed Canary Grass
Common Hawthorn		Herb Robert	
Rowan (European Mountain Ash)		Chickweed	
Domestic Cherry			

### 3.6.5 Threatened and endangered species

The following federally listed or proposed species may be present in the vicinity of the project.

Chinook salmon (*Oncorhynchus tshawytscha*) threatened

Bull trout - (*Salvelinus confluentus*) threatened

Coho - (*Oncorhynchus kisutch*) candidate

Bald eagle -(*Haliaeetus leucocephalus*) threatened

*Chinook* - The Puget Sound chinook salmon Evolutionary Significant Unit (ESU), including the populations in the Lake Washington Basin, were proposed for listing as threatened under the federal Endangered Species Act on 9 March 1998 (63 FR 11482). Cedar River chinook salmon, along with 28 other stocks, have been placed into the Puget Sound ESU by NMFS (Myers et al. 1998). The Puget Sound ESU encompasses all chinook populations from the Elwha River on the Olympic Peninsula to the Nooksack River in North Puget Sound and south to the Nisqually River. The five-year mean natural escapement (1992-1996) for the Puget Sound ESU is approximately 27,000 spawners; recent total escapement (natural and hatchery fish) has averaged 71,000 spawners (Myers et al. 1998).

At least three stocks of chinook are present in Lake Washington: (1) the Issaquah Creek stock, a composite population (utilizing Green River stock) that is at least partially sustained by production from the Issaquah hatchery; (2) the Cedar River stock, classified as native/wild; and (3) the north Lake Washington tributary stock also classified as native/wild. Lake Washington chinook represent approximately 12% of the natural escapement occurring in the Puget Sound ESU. The WDFW listed the status of chinook in the Cedar River as unknown due to unreliable abundance data (WDFW et al. 1994). Summer/fall chinook of the Cedar River basin are distinguished from other Puget Sound stocks by geographic isolation. The stock is native and all production comes from naturally spawning fish. Genetic analysis has not been conducted to date (WDFW et al. 1994). Recent trends in abundance of Lake Washington chinook have declined since 1991. The Lake Washington chinook stock is now considered to be depressed (City of Seattle 1998).

For the past 7-10 years (1987-1996 returns), each of the three Lake Washington stocks has shown a steep downward trend in adult returns. Annually, decline for each run has

been greater than 8% with the Cedar River declining at 10.1% per year (5 year geometric mean of 377 fish), North Lake Washington 16.6% (5 year mean of 145 fish), and Issaquah Creek 8.0%. Over a longer time period, the downward trends have been more variable with the Cedar River declining 2.2% (1964-1996) and North Lake Washington 11.1% per year (1983-1996). Of 23 chinook populations in Puget Sound, Lake Washington was among five populations showing the steepest decline (>5% per year) (Meyers et al. 1998).

All trend analysis conducted by WDFW data or NMFS has focused on adult return years from 1996 and earlier. Recent adult returns from 1997 and 1998 have not been incorporated in trend analysis. These two latest years would incorporate some measure of improvements, possibly attributed to increased smolt survival through the Ship Canal and Locks since 1994. Adult returns (run-size counts at the Locks by Muckleshoot Tribe) for these latest two years have averaged approximately 7,500 fish per year, approaching early 1980's run-size totals. However, adult returns are predominantly hatchery run fish, although recent returns to Bear Creek indicate there may be improvement for some wild stocks in Lake Washington.

*Bull trout* - The coastal/Puget Sound bull trout population segment was listed as threatened under the Endangered Species Act of 1973, as amended (64 FR 16397). A 1998 WDFW study reported 80 bull trout/Dolly Varden populations in Washington: 14 (18%) were healthy; two (3%) were in poor condition; six (8%) were critical; and the status of 58 (72%) was unknown. Bull trout are estimated to have occupied approximately 60% of the Columbia River Basin and presently occur in only 45% of the estimated historical range (Quigley and Arbelbide 1997).

In the past 10 years, only two "native char" have been reported in Issaquah Creek and none have been reported in the Sammamish River (64 FR 16397; 1999; WDFW 1998). The USFWS is not certain that the latter subpopulation is "viable." There is no known spawning subpopulation resident in Lake Washington or Lake Sammamish, however, bull trout have been observed in the fish ladder viewing pool at the Locks as recently as 1997 (F. Goetz, USACE, *pers. comm.*) and isolated reports of bull trout captures in or around Lake Washington occur every few years. A larger juvenile bull trout (~250 mm, 3 year old) was caught in the lower Cedar River in July of 1998 (M. Martz, USACE, *pers. comm.*).

The only likely viable bull trout subpopulation in the Lake Washington watershed is the Chester Morse Reservoir subpopulation. However, the Chester Morse Reservoir subpopulation is above an anadromous barrier and is a glacial relic population (WDFW 1998). The population exhibits an adfluvial life history strategy, although residents could exist in the upper watershed (WDFW 1998). Because all life history strategies can arise from the same population, it is possible that some fish emigrate from the Chester Morse Reservoir to exhibit anadromy or to reside in Lake Washington. Water temperatures in the lower Cedar River may be too high to support a fluvial population (WDFW 1998).

*Bald eagle* - The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species and a threatened species at the state level in Washington. The bald eagle was listed as endangered throughout the lower 48 states in 1978, except for Michigan,

Minnesota, Wisconsin, Washington, and Oregon, where it was listed as threatened. In 1995, bald eagle populations in other states were downlisted from endangered to threatened by the U.S. Fish and Wildlife Service. In Washington State, the number of active bald eagle nests has increased steadily since 1980, and now numbers over 550 (WDFW 1997). Signs of a local comeback were evident when the first eagle nest within Seattle was found in 1980 in Seward Park. Currently, two pairs of eagles nest in the park within a half mile of each other, an unusually close distance. In 1999 each pair raised two chicks. The eagles are often seen fishing or hunting coots or ducks along the lakeshore.

### 3.7 CULTURAL RESOURCES

A review of the Washington State Office of Archaeology and Historic Preservation (OAHP) cultural resources database by a Corps staff archaeologist revealed no recorded archaeological or historical sites in the project area. It is unlikely that cultural resources exist within the 30 foot by 1,000 foot project footprint immediately offshore of Seward Park.

The Muckleshoot and Suquamish Tribes, within the boundaries of their usual accustomed fishing areas, are co-managers of fishery resources within the Lake Washington watershed with the Washington Department of Fish and Wildlife. Specific fishing areas for the Suquamish include Shilshole Bay below the Locks, Elliot Bay, and the Duwamish estuary (up to the Spokane Street Bridge). Specific fishing areas for the Muckleshoot include Shilshole and Elliot Bay, Area 10 and all saltwaters of Puget Sound, Lake Washington, Lake Sammamish, the Cedar, Green and Puyallup/White Rivers. The Muckleshoot Tribe has been a leading proponent of salmon protection and recovery efforts within the Lake Washington basin.

As co-managers of anadromous fish resources, the Muckleshoot are directly involved in the City of Seattle's operation of water management activities in the Cedar River. Technical staff represent the Tribe each year during pre-season forecasting, refill, and flow augmentation coordination. Muckleshoot and Suquamish tribal staff have been involved in planning studies and fish and wildlife management activities within the Ship Canal. Staff were members of the Pinniped Interagency Taskforce; determining management options to deal with predation of California sea lions on Lake Washington steelhead. Staff have also been members of the Corps facilitated Ship Canal Fisheries Interagency Workgroup; directly involved in baseline monitoring and helping identify problems and assisting in development of solutions for adult and juvenile fish passage at the Locks. Lastly, the Muckleshoot Tribe was the initial local sponsor for the Section 1135 project and provided direct funding for the WES evaluation of slow fill procedures (Waller et al. 1998).

### 3.8 RECREATION

The project area is heavily visited, particularly during the recreational boating season and the summer adult salmon migration period, by public from all over the world. Fishing is an important recreation in the Lake Washington. However, the decline and depressed stock status of several fish species including the sockeye salmon have resulted in a reduction of tribal, commercial and recreational/sport fisheries in Lake Washington. In

the past, sport fishing of sockeye salmon on Lake Washington was intense. In 1988 and 1996, 140,000 and 80,000 adult sockeye were caught by recreational anglers, respectively. Based on recreational harvest during those years, various observers have called Lake Washington the largest urban sport fishery in the world.

At Seward Park there are 5 picnic shelters and several tables, 2 unlighted tennis courts, swimming - guarded beach in summer months, and art studio, bike and walking paths (waterfront loop: 2.5 miles), hiking trails, a amphitheater, and a native plant garden. The park receives heavy use throughout the year.

### 3.9 SOCIOECONOMICS

Since 1980, King County has grown from a population of 1,270,000 to 1,665,800 in 1998. This reflects an absolute gain of 395,800 people or an increase of over 31 percent and an annual rate of growth of 1.5% per year. The city of Seattle is the largest in King County with a 1998 population of 534,700 – 9% larger than 1986.

Current forecasts from the State Office of Financial Management indicate a King County population exceeding 2.0 million by the year 2020, 57 percent of which is due to the immigration. The population growth rate in King County is expected to be lower between 1995 and 2020 (26 percent increase or 1.01 percent annual rate) than in the previous twenty-five years (39 percent or 1.6 percent annual rate).

The City of Seattle develops annual base water demand forecasts using population growth estimates of the Puget Sound Regional Council. Average annual demand, in million gallons per day (mgd), for the past twenty years has gone from 160 mgd in the 1980s to less than 150 mgd in the 1990's: conservation programs and drought conditions resulted in the 1990's decline. Projections for the 2020 show a range of 160 to 180 mgd and for 2040 from 210 to 240 mgd. The lower range is based on a program to conserve 1% of demand per year for 10 years. The higher range does not incorporate the conservation program (data from CRYSTAL Workshop, University of Washington, May 1999).

The economy of King County is dependent on many industries including aerospace equipment, ships, and trucks manufacturing; forest products industry ranging from the harvesting of saw logs to the manufacture of finished wood and pulp products; wholesale and retail trade; sea food distribution; tourism; commercial boating; and increased pleasure boating industry; and most recently, computer software engineering.

## 4.0 EFFECTS OF ALTERNATIVES

### 4.1 CLIMATE

#### *No action alternative*

Under this alternative climate would not be affected.

#### *Substrate removal alternative*

Under this alternative climate would not be affected.

*Preferred alternative -substrate supplement*

Under this alternative climate would not be affected.

## 4.2 AIR QUALITY/NOISE

*No action alternative*

Under this alternative air quality or noise would not be affected

*Substrate removal alternative*

Under this alternative there will be a temporary and localized reduction in air quality due to emissions from equipment operating during dredging and disposal. Ambient noise levels will increase slightly while equipment is operating.

The project site is located in the Puget Sound carbon monoxide non-attainment area and the Puget Sound ozone non-attainment area. Carbon monoxide, a product of incomplete combustion, is generated by automobiles and other fuel burning activities (e.g. residential heating with wood). The highest ambient concentrations of carbon monoxide tend to occur in localized areas such as major roadways and intersections during periods of low temperatures, light winds, and stable atmospheric conditions. Ozone is a highly reactive form of oxygen created by sunlight-activated chemical reactions of nitrogen oxides and volatile organic compounds. Unlike high carbon monoxide concentrations, which tend to occur close to emission sources, ozone problems tend to be regional since ozone precursors can be transported far from their sources. Ozone precursors are primarily generated by motor vehicle engines.

During construction, there was a temporary and localized reduction in air quality due to emissions from heavy machinery operating during barge transport, pile driving, fill placement, and grading. These emissions did not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan. Therefore, impacts were not significant.

Ambient noise levels increased slightly while construction equipment was operating. However, these effects were temporary and localized, and occurred only during daylight working hours. As a result, impacts would be minimal.

*Preferred alternative -substrate supplement*

Under this alternative there will be a temporary and localized reduction in air quality due to emissions from equipment operating during dredging and disposal. Ambient noise levels will increase slightly while equipment is operating. However, work is only expected to take place over one to two days. This would minimize any affect on air quality/noise. These effects are regarded as minimal.

## 4.3 VISUAL/ESTHETIC ENVIRONMENT

*No action alternative*

Under this alternative the visual/esthetic environment would not be affected.

*Substrate removal alternative*

Under this alternative, there would be a temporary disturbance to the visual esthetics of the area. Construction activity may be unsightly for the term of the project. However, the project would have no long term effects on visual esthetics of the area.

*Preferred alternative -substrate supplement*

Under this alternative, there would be a temporary disturbance to the visual esthetics of the area. However, construction is only expected to last one day and the project would have no long term effects on visual esthetics of the area.

#### 4.4 PHYSICAL AND GEOLOGIC ENVIRONMENT

*No action alternative*

Under this alternative, the physical and geologic environmental would not be affected.

*Substrate removal alternative*

Under this alternative, the physical and geologic environmental would not be affected.

*Preferred alternative -substrate supplement*

Under this alternative, the physical and geologic environmental would not be affected.

#### 4.5 WATER AND SEDIMENT QUALITY

*No action alternative*

Under this alternative the water and sediment quality would not be affected.

*Substrate removal alternative*

Under this alternative water quality is expected to be temporarily degraded during substrate removal. Degraded water quality includes, suspended sediments and lower dissolved oxygen. These effects are expected to last during the time of construction through several hours after work is completed. After construction the levels are expected to return to normal levels. Removal option would take longer and require disturbances to substrates (sand/silt). Under this alternative we would expect higher turbidity for a longer period than the preferred alternative.

*Preferred alternative -substrate supplement*

Under this alternative substrate modification operations will degrade water quality on a very localized and temporary basis, not over the long term nor lake-wide. Turbidity from an individual construction activity would not represent a permanent sediment source and would not produce conditions of chronic exposure, but it could be acute. However, given the relatively small quantities of sediment typically suspended, the short duration of suspension, and the dilution that occurs during dispersion, the suspension of sediments around the project site is not likely to lead to appreciable reductions in dissolved oxygen nor increases in turbidity. Overall, the impacts are expected to be minor due to the fact that placement will take place over only one day. Also the material used will be clean and free of any contamination. Nevertheless, to minimize potential impacts, the Corps

will restrict construction activity to periods when salmonids are least likely to inhabit the area of construction.

#### 4.6 BIOLOGICAL RESOURCES

##### 4.6.1 Fish

###### *No action alternative*

Under this alternative the fish present in Lake Washington would not be affected. Under this alternative the aquatic organisms would not be affected.

###### *Substrate removal alternative*

According to surveys completed in 2000, the timing of this alternative would occur when very few fish are present. However, implementing this alternative is may have temporary effects on some fish. Removing the substrate would result in a temporary degradation of the water quality, increasing turbidity, possible lowering of dissolved oxygen and the potential displacement of fish species. These effects would be limited to the immediate substrate removal sites. Should fish species coincidentally be present in the substrate removal area, it is highly likely that these fish would remove themselves from the area immediately upon commencement of the actual substrate removal. This removal would be temporary in nature and fish could re-enter the area once operations ceased and suspended sediments settled. Suspended sediments are not expected to remain in the water column for very long (approximately ten minutes in midwater areas) and dissolved oxygen should return to original levels with that same timeframe. Implementing this alternative will have adverse effects on invertebrate species within the immediate dredging location and minimum effects on invertebrates at the disposal sites. Direct mortality of some invertebrates is unavoidable in the dredging area because of the nature of removing the substrate. Benthic communities are expected to recolonize the area soon after work is completed.

###### *Preferred alternative -substrate supplement*

According to surveys completed in 2000, the timing of the preferred alternative would occur when very few fish are present. However, implementing this alternative is may have temporary effects on some fish. Substrate modification may result in a temporary degradation of the water quality, increasing turbidity, possible lowering of dissolved oxygen and the potential displacement of fish species. These effects would be limited to the immediate substrate modification sites. Should fish species coincidentally be present in the substrate removal area, it is highly likely that these fish would remove themselves from the area immediately upon commencement of the substrate addition. This removal would be temporary in nature and fish could re-enter the area once operations ceased and suspended sediments settled. Suspended sediments are not expected to remain in the water column for very long (approximately ten minutes in midwater areas) and dissolved oxygen should return to original levels with that same timeframe (Truitt, 1986a; 1986b).

The presence of a barge would temporarily shade the water column under the barge. The barge may also would create wakes and disturb the water column under the boats, as well as generate loud noises. The effects of wakes are felt to a depth of about 5 feet; beyond this depth, the wake energy is significantly attenuate. Fish in the vicinity of the area are in water up to 172 feet in depth; the slight disturbance near the surface is not

expected to disturb most fish, other than cause them to avoid the wake by moving deeper into the water. All effects are temporary and would be concluded within 1-2 days.

Implementing the preferred alternative will have adverse effects on invertebrate species within the immediate dredging location and minimum effects on invertebrates at the disposal sites. Placement of addition substrate has the potential to bury immobile invertebrates if greater than 10 cm of material is deposited. Otherwise, mobile invertebrates are expected to dig out of 10 cm or less of material.

Substrate modification is likely to be of minor consequence since the biological effect of episodic inputs has been found generally to be temporary (Tsui and McCart 1981). Rapid recovery often results. Koehler (pers. comm) has indicated that the new substrate will likely increase the amount of chironomids which is an important food source for juvenile chinook early in the spring.

#### **4.6.3. Wildlife**

##### *No action alternative*

Under this alternative the wildlife would not be affected.

##### *Substrate removal alternative*

Under this alternative the wildlife would not be affected

##### *Preferred alternative -substrate supplement*

Under this alternative the wildlife would not be affected. No measurable change would be realized from implementing the preferred alternative

#### **4.6.4 Flora**

##### *No action alternative*

Under this alternative the flora would not be affected.

##### *Substrate removal alternative*

Under this alternative the flora would not be affected.

##### *Preferred alternative -substrate supplement*

Under this alternative the flora would not be affected.

#### **4.6.5 Threatened and endangered species**

##### *No action alternative*

Under this alternative, threatened and endangered species would not be affected.

##### *Substrate removal alternative*

Under this alternative, it is possible that the project may affect but will not likely adversely affect threatened and endangered species.

##### *Preferred alternative -substrate supplement*

Under the preferred alternative, the Corps has determined that the project may affect but will not likely adversely affect threatened and endangered species. See attached biological assessment for detailed evaluation.

## 4.7 CULTURAL RESOURCES

### *No action alternative*

Under this alternative cultural resources would not be affected.

### *Substrate removal alternative*

A review of the Washington State Office of Archaeology and Historic Preservation (OAHP) cultural resources database by a Corps staff archaeologist revealed no recorded archaeological or historical sites in the project area. It is unlikely that cultural resources exist within the 30 foot by 1,000 foot project footprint immediately offshore of Seward Park. However, removal of substrate may disturb, however slight, to intact cultural deposits.

### *Preferred alternative -substrate supplement*

A review of the Washington State Office of Archaeology and Historic Preservation (OAHP) cultural resources database by a Corps staff archaeologist revealed no recorded archaeological or historical sites in the project area. It is unlikely that cultural resources exist within the 30 foot by 1,000 foot project footprint immediately offshore of Seward Park. Furthermore, the placement of new substrate will not disturb any of the underlying native sediments that have the potential, however slight, to contain intact cultural deposits. Therefore, the Corps has determined that the project has no potential to affect properties eligible for listing on the National Register of Historic Places (NRHP).

## 4.8 RECREATION

### *No action alternative*

Under this alternative recreation would not be affected.

### *Substrate removal alternative*

Under this alternative recreation would not be affected.

### *Preferred alternative -substrate supplement*

Under this alternative recreation would not be affected.

## 4.9 SOCIOECONOMICS

### *No action alternative*

Under this alternative socioeconomics would not be affected.

### *Substrate removal alternative*

Under this alternative socioeconomics would not be affected

### *Preferred alternative -substrate supplement*

Under this alternative socioeconomics would not be affected

## 4.10 CUMULATIVE EFFECTS

It is difficult to determine cumulative effects for this project as little is known about salmonid habitat use of lakes, or how they are affected by shoreline development. However, if juvenile salmonids do select habitat according to substrate and depth, then most likely this project will have a net benefit for salmon species in Lake Washington since the shoreline of Lake Washington is so extensively developed.

## **5.0 ENVIRONMENTAL COMPLIANCE**

### **5.1 ARCHEOLOGICAL RESOURCES PROTECTION ACT OF 1979**

The Corps is in full compliance with this act.

### **5.2 CLEAN AIR ACT, AS AMENDED**

The Clean Air Act required states to develop plans, called state implementation plans (SIP), for eliminating or reducing the severity and number of violations of national ambient air quality standards (NAAQS) while achieving expeditious attainment of the NAAQS. The act also required federal actions to conform to the appropriate SIP. An action that conforms with a SIP is defined as an action that will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The Corps' determination is that emissions associated with this project will not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone).

### **5.3 CLEAN WATER ACT, AS AMENDED**

A 404(b) evaluation will be needed for the project actions. The US Army Corps of Engineers, Seattle District is in the process of completing a 404(b)1 evaluation (Appendix E).

A 401 water quality certification will be required by the Washington Department of Ecology. This includes any work below the ordinary high water line.

### **5.4 COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED**

The coastal zone management act of 1972, as amended, requires federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved state coastal zone management program. This project will comply with the Washington Coastal Zone Management Program and will be conducted in a manner consistent with that Program.

### **5.5. ENDANGERED SPECIES ACT OF 1973, AS AMENDED**

In accordance with section 7(a)(2) of the endangered species act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. Currently the US Army Corps of Engineers is undergoing informal consultation with the US Fish and Wildlife Service and National Marine Fisheries Service. A biological assessment has been prepared and is attached to this draft of the EA. The BA will be reviewed by the Services.

## 5.6 ESTUARY PROTECTION ACT

This law has been determined to be not applicable, as the project does not occur in an area regulated under this act.

## 5.7 FISH AND WILDLIFE COORDINATION ACT, AS AMENDED

The fish and wildlife coordination act (16 usc 470) requires that wildlife conservation receives equal consideration and is coordinated with other features of water resource development projects.

## 5.8 LAND AND WATER CONSERVATION FUND ACT OF 1965, AS AMENDED

The corps has determined the project to be in full compliance.

## 5.9 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, AS AMENDED

The environmental assessment incorporated within this report is in partial fulfillment of NEPA requirements. This EA will be available for review by the agencies for 30 days.

## 5.10 NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED

The National Historic Preservation Act (16 USC 470) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. A review of the Washington State Office of Archaeology and Historic Preservation (OAHP) cultural resources database by a Corps staff archaeologist revealed no recorded archaeological or historical sites in the project area. It is unlikely that cultural resources exist within the 30 foot by 1,000 foot project footprint immediately offshore of Seward Park. Furthermore, the placement of new substrate will not disturb any of the underlying native sediments that have the potential, however slight, to contain intact cultural deposits. Therefore, the Corps has determined that the project has no potential to affect properties eligible for listing on the National Register of Historic Places (NRHP).

## 5.11 RIVERS AND HARBORS ACT OF 1899, AS AMENDED

Under section 10 of the rivers and harbors act, a project can not obstruct navigable water of the United States. The Corps has determined that the project is in full compliance. The proposed work would not obstruct navigable water of the United States.

#### 5.12 WILD AND SCENIC RIVER ACT, AS AMENDED

The Corps has determined the project to be in full compliance. This project would not have any direct and adverse effect on the values for which a river was established as a designated component of the national wild and scenic river system.

#### 5.13 SECTION 904 OF THE 1986 WATER RESOURCES DEVELOPMENT ACT

Section 904 of the 1986 water resources development act requires that the plan formulation and evaluation process consider both quantifiable and unquantifiable benefits and costs of the quality of the total environment, and preservation of cultural and historical values. This report and project are in full compliance.

#### 5.14 SECTION 307 OF THE 1990 WATER RESOURCES DEVELOPMENT ACT

Section 307 of the 1990 water resources development act establishes, as part of the water resources development program, an interim goal of no overall net loss of the nation's remaining wetlands, and a long-term goal of increasing the quality and quantity of the nation's wetlands. The recommended plan is in full compliance.

#### 5.15 E.O. 11988, FLOODPLAIN MANAGEMENT

The study is in full compliance. The considered alternatives support avoidance of development in the flood plain, continue to reduce hazards and risks associated with floods and to minimize the impact of floods on human safety, health and welfare, and restores and preserves the natural and beneficial values of the base flood plain.

#### 5.16 E.O. 11990, PROTECTION OF WETLANDS

The project is in full compliance.

#### 5.17 E.O.12898, ENVIRONMENTAL JUSTICE

Executive order 12898 requires the federal government to achieve environmental justice by identifying and addressing disproportionately high adverse effects of its activities on minority and low-income populations. It also requires the analysis of information such as the race, national origin, and income level for areas expected to be impacted by environmental actions. The project will not negatively affect low-income or minority populations. It is not likely the proposed work will have a significant effect on Native American fishery rights or resources.

### **6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

No federal resources will be irreversibly and irretrievably committed to this project until the “finding of no significant impact” (FONSI) is signed.

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